Status of the GCOM-W mission and AMSR follow-on instrument

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Status of GCOM activity

- GCOM activity is still in “research” phase (not yet approved as the JAXA project).
- GCOM concept was included in the report of the special session for Earth observation of the Space Activities Commission (SAC) of Japan.
- JAXA internal concept study was conducted in JFY 2004. Component study is being initiated for critical items of observing instruments.
- Realization of scatterometer provision is still under discussion with US (NASA and NOAA).

GCOM overview

- GCOM:
  - Japanese contribution to the GEOSS concept in demonstrating satellite climate change observation.
  - Follow-on mission of Midori-II.
- System
  - Two medium size satellites: GCOM-W and GCOM-C (names are provisional)
  - 3 consecutive satellite generations with 1 year overlap will result in over 13 years of observation.
- Continuing AMSR-E and GCOM-W will provide long-term data set over 20 years.

GCOM satellites

- GCOM-C
  - Instrument: Second generation of GLI (SGLI)
  - Contribute to surface and atmospheric measurements related to carbon cycle and radiation budget.
  - Launch year (target): JFY 2011
- GCOM-W
  - Instrument: AMSR follow-on instrument and scatterometer (like SeaWinds on Midori-II)
  - Contribute to observations related to global water and energy circulation.
  - Launch year (target): JFY 2010

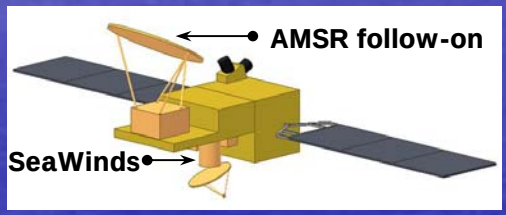
Importance of AMSR continuation

- Continue unique AMSR observation (high-res and global) and construct long-term dataset.
- Reliable long-term time series of SST, sea surface winds, water vapor, precipitation, and ocean flux to contribute to the understanding, monitoring, and forecast of climate change.
- Operational benefits include continuous measurement of cloud-through SST, frequent and quantitative measurements of storms to maintain precipitation forecast accuracy.
- Overlapping period of consecutive sensors aids cross-calibration to establish stable long-term records.

GCOM-W mission requirements

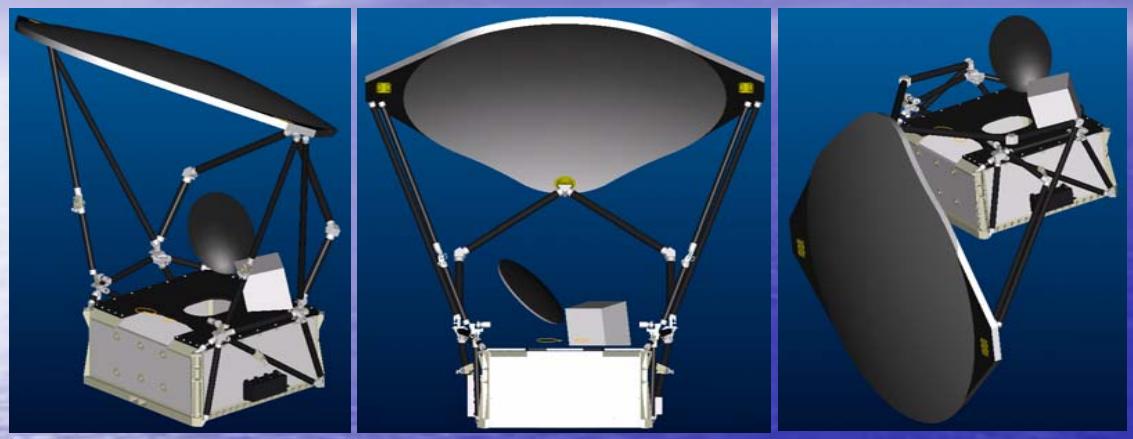
- Requirements
  - Keep the Midori-II AMSR performance and continue the AMSR-E observation (except 50GHz channels).
  - Improve calibration (particularly hot load).
  - Mitigate RFI at C-band observation.
  - Combination with scatterometer.
- Other discussions (not adopted this time)
  - Higher frequency channels (e.g. 150, 183GHz).
  - Polarimetric channels (U and V at 18, 36GHz).
  - Enhancement of spatial resolution at lower frequency.

Concept study: Satellite (-W)

Orbit	Type : Sun-synchronous, sub-recurrent Altitude : 699.6km Inclination : 98.19 degrees Local time of ascending node : 13:30
Satellite overview	
Mission life	5 years
Launch vehicle	H2A launch vehicle
Mass	Satellite : 2000kg Instruments : 580kg
Instrument	AMSR follow-on instrument Microwave scatterometer (assuming SeaWinds)
Launch (target)	JFY 2010

* Orbit characteristics will be changed depending on launch configuration.

Concept study: AMSR F/O



- Deployable main reflector system with diameter of 2.0 meters.
- Frequency channel set identical to that of AMSR-E.
- Improvement of HTS (hot load).
- Sub-band configuration for 6.925 GHz frequency channels will be investigated.

Center frequency [GHz]	Band width [MHz]	Polarization	Beam width [deg] (Ground resolution [km])	Sampling interval [km]
6.925	350	V and H	1.8 (35 x 62)	10
10.65	100		1.2 (24 x 42)	
18.7	200		0.65 (14 x 22)	
23.8	400		0.75 (15 x 26)	
36.5	1000		0.35 (7 x 12)	
89.0	3000		0.15 (3 x 5)	5

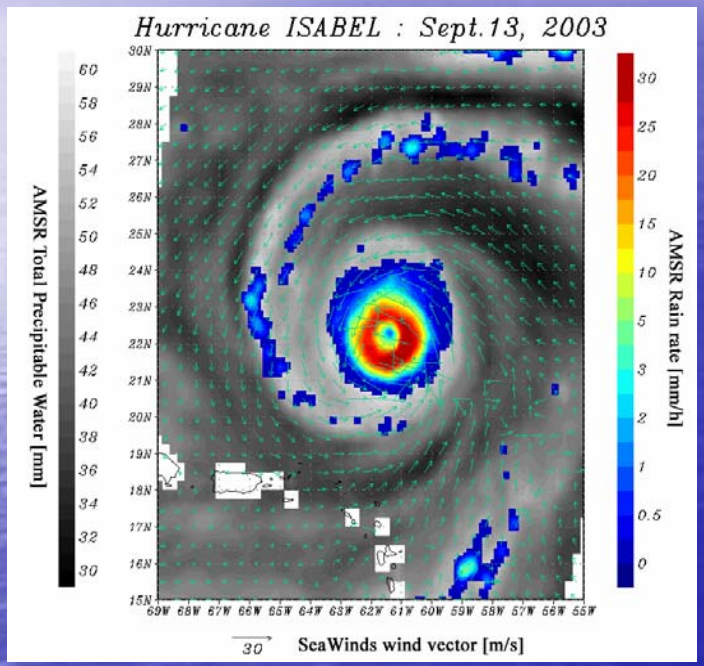
Upper: Overview of AMSR follow-on instrument (sensor unit) from concept study. Left and center figures indicate deployed condition of main reflector. Right figure shows stowed position.

Lower: Major sensor parameters derived by assuming an orbit altitude of 705 km.

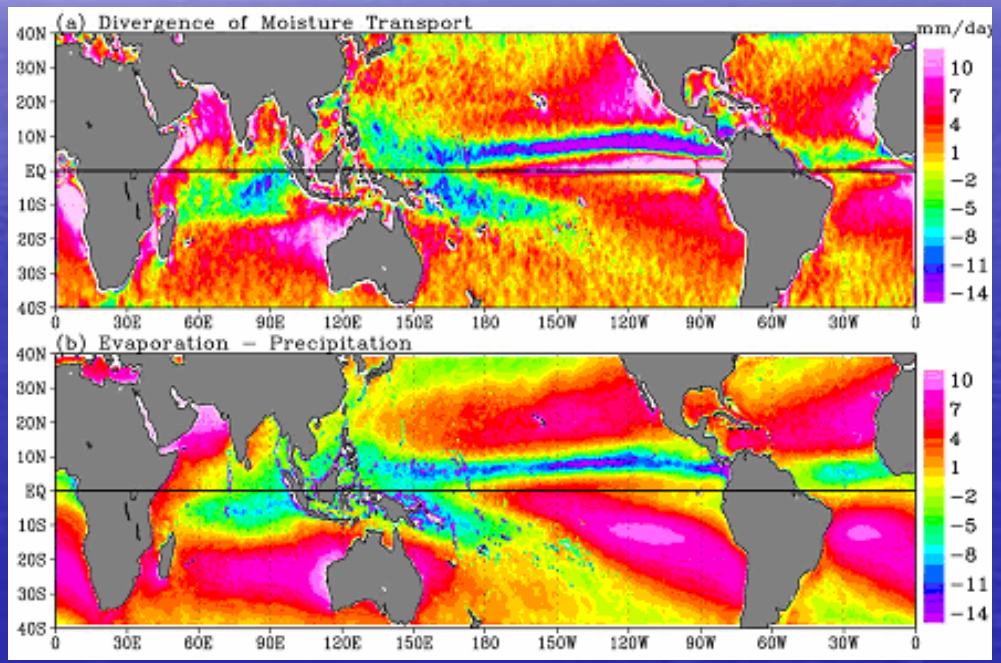
SeaWinds/AMSR combination

- Scatterometer/Radiometer combination since SeaSat.
- Advantages
  - SeaWinds : Rain flagging and attenuation/scattering correction.
  - AMSR : Constructing Tb model as a function of wind vector.
- Application to Meteorology/Physical Oceanography
  - Ocean surface heat flux : needs simultaneous observation.
  - Simultaneous measurements of water vapor, SST, precipitation, and sea surface winds are effective for investigating various time-space scale phenomenon (MJO, typhoon, monsoon, ENSO, water-energy cycle, ocean circulation in surface mixed layer)
- Sensor and Science Synergism (radiometer and scatterometer) was summarized and documented jointly with scatterometer team (Drs N. Ebuchi and T. Liu).

SeaWinds/AMSR combination



Hurricane Isabel captured by the simultaneous measurements of AMSR (water vapor and precipitation) and SeaWinds (sea surface wind vector) on Midori-II.



Annual mean (a) divergence of moisture transport integrated over the depth of the atmosphere, and (b) evaporation-precipitation. Evaporation and precipitation were estimated independently from TRMM data. Moisture transport was estimated from a combination of TRMM and QuikSCAT data. From Xie and Liu (2005).

Continuity of Scatterometer

- Ocean wind vector measurement continues for over 10-years since ERS-1/AMI launch in 1991.
- Wind vector retrieval by polarimetric radiometer is being demonstrated by Windsat, but still in validation phase.
- GCOM-W scatterometer in afternoon orbit will increase time resolution and data coverage in combination with the METOP/ASCAT in morning orbit.
- Scatterometer data are valuable in operational use.

Summary

- Global Change Observation Mission (GCOM) is now being proposed by JAXA.
- Two medium size satellites: GCOM-W and -C.
- Two instruments are proposed for GCOM-W: the AMSR follow-on instrument and scatterometer.
- First priority of the AMSR F/O is to continue the AMSR-E observation that can provide global microwave mapping with high-spatial resolution.
- Current target of the launch year of GCOM-W satellite is 2010.